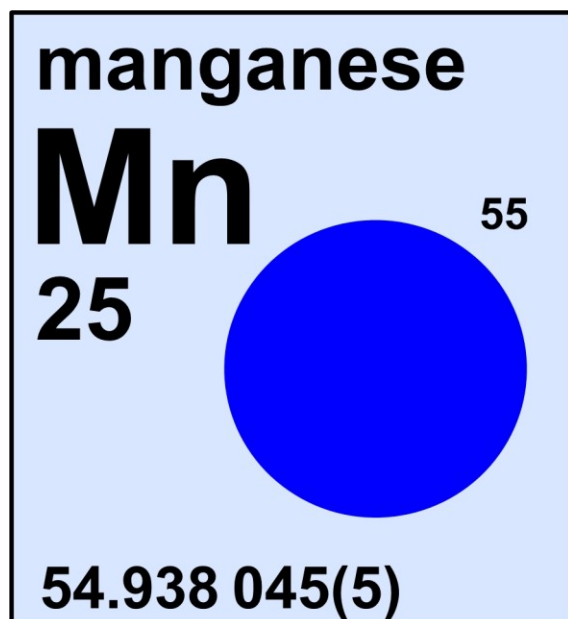


## manganese

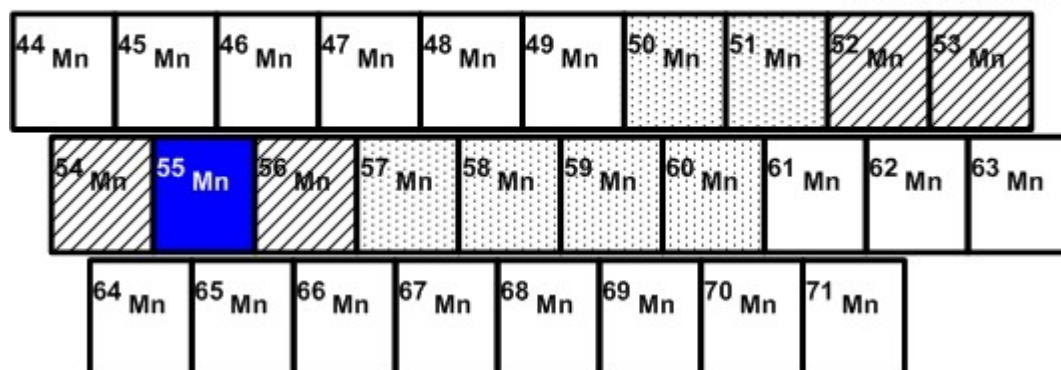


Stable isotope	Atomic mass*	Mole fraction
<sup>55</sup> Mn	54.938 0451	1.0000

\* Atomic mass given in unified atomic mass units, u.

### Half-life of radioactive isotope

Less than 1 second  
 Between 1 second and 1 hour  
 Greater than 1 hour



## Important applications of stable and/or radioactive isotopes

### Isotopes in geology

- 1) <sup>53</sup>Mn is formed by interaction of iron in rocks with cosmic radiation. The accumulation of <sup>53</sup>Mn at the earth's surface permits determination of exposure ages of landforms to cosmic rays and quantification of erosion rates.



Figure 1: Cosmic radiation entering Earth's atmosphere.

#### Isotopes in planetary sciences

- 1) Anomalous  $^{53}\text{Cr}/^{52}\text{Cr}$  isotope ratios in meteoritic material from decay of  $^{53}\text{Mn}$  have been used successfully to study the early history of our solar system.

#### Isotopes in medicine

- 1)  $^{51}\text{Mn}$ ,  $^{52}\text{Mn}$  and  $^{52\text{m}}\text{Mn}$  are positron emitting radio-nuclides that are used in PET imaging.
- 2)  $^{51}\text{Mn}$ ,  $^{52}\text{Mn}$  and  $^{52\text{m}}\text{Mn}$  have been suggested for use in diagnosis and treatment of blood diseases as tracers of cationic perfusion incl. studies of myocardial and cerebral perfusion.

#### Isotopes in tracer studies

- 1) The primary radiotracer used in biological studies is the gamma emitting isotope  $^{54}\text{Mn}$  (half-life: 312 days).
- 2) Other radioisotopes, such as  $^{52}\text{Mn}$  and  $^{56}\text{Mn}$ , have also been used in tracer experiments but their short half-life requires experiments to be conducted at the site of production.

#### Isotopes in environmental studies and climatology

- 1)  $^{54}\text{Mn}$  has been used to predict migration of heavy metal components in effluents from mining waste.